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BUREAU OF MINES MINERALS YEARBOOK

Fluorspar

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UNITED STATES DEPARTMENT OF THE INTERIOR

The statistical data in this volume represents the most comprehensive, verified, domestic and international coverage for 1985 at the time the volume went to press. More recent information can be found in the quarterly Fluorspar Mineral Industry Surveys obtainable from Publications Distribution, Bureau of Mines, Box 18070, Cochrans Mill Road, Pittsburgh, PA 15236.

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READEX FICHE

UNITED STATES DEPARTMENT OF THE INTERIOR • Donald Paul Hodel, Secretary

BUREAU OF MINES • Robert C. Horton, Director

This publication is a chapter from the current Bureau of Mines Minerals Yearbook, comprising *Volume I, Metals and Minerals; Volume II, Area Reports: Domestic; Volume III, Area Reports: International.* The separate volumes of the Yearbook are sold by the Superintendent of Documents, Washington, D.C. 20402.

Fluorspar

By Lawrence Pelham[1]

Fluorspar was recovered by one major producer and three small producers. Domestic fluosilicic acid (H_2SiF_6) recovery, a byproduct of some phosphoric acid and hydrofluoric acid (HF) plants, increased 12% over revised 1984 production. In the chemical industry, fluosilicic acid continued to augment fluorspar as a source of fluorine.

The United States depended on foreign sources for over 90% of its fluorspar requirements. Imports and consumption decreased because of significant decreases in fluorspar consumption by HF and iron and steel producers and a substantial decrease in consumer stocks.

Domestic Data Coverage.—Domestic production data for fluorspar are developed by the Bureau of Mines from four separate, voluntary surveys of U.S. operations. Surveys are conducted to obtain fluorspar mine production and shipments, fluosilicic acid production, fluorspar briquet production, and fluorspar consumption. Of the five fluorspar mining operations to which a survey request was sent, 100% responded, representing 100% of the production shown in table 1. Of the 16 fluosilicic acid producers, 87% responded, representing 99% of the quantity reported. Of the five briquet producers, 80% responded, representing 78% of the quantity reported. The consumption survey was sent to approximately 140 operations quarterly and 40 additional operations annually. Of the operations surveyed quarterly, 55% responded for the first quarter, 74% responded for the second quarter; 42% responded for the third quarter; and 54% responded for the fourth quarter. Of the 40 operations surveyed annually, 50% responded. Together, quarterly and annual responses represented 100% of the apparent consumption data shown in table 1.

Table 1.—Salient fluorspar statistics[1]

		1981	1982	1983	1984	1985
United States:						
Production:						
Mine production	short tons	415,882	199,714	W	W	W
Material beneficiated	do.	419,958	231,726	W	W	W
Material recovered	do.	111,291	76,316	W	W	W
Finished (shipments)	do.	115,404	77,917	e61,000	e72,000	e66,000
Value, f.o.b. mine	thousands	$16,412	$13,293	e$10,000	W	W
Exports	short tons	11,261	10,573	9,236	12,286	9,671
Value	thousands	$1,194	$1,084	$962	$1,282	$1,063
Imports for consumption	short tons	826,793	543,723	452,314	703,711	552,959
Value[2]	thousands	$104,938	$67,665	$47,032	$65,241	$49,639
Consumption (reported)	short tons	932,855	530,565	564,187	752,581	567,623
Consumption (apparent)[3]	do.	897,572	618,499	613,705	r742,431	682,965
Stocks, Dec. 31:						
Domestic mines:						
Crude	do.	200,606	164,094	W	W	W
Finished	do.	12,924	10,816	W	W	W
Consumer	do.	216,297	207,880	99,253	120,267	46,590
World: Production	do.	r5,816,455	r4,963,735	4,655,787	p5,270,263	e5,267,976

eEstimated. pPreliminary. rRevised. W Withheld to avoid disclosing company proprietary data.

[1]Does not include fluosilicic acid (H_2SiF_6) or imports of hydrofluoric acid (HF) and cryolite.

[2]C.i.f. U.S. port.

[3]U.S. primary and secondary production plus imports, minus exports, plus adjustments for Government and industry stock changes.

Legislation and Government Programs.—At yearend, the National Defense Stockpile inventory was unchanged from 1984 levels at 895,983 short tons of acid grade and 411,738 tons of metallurgical grade. The stockpile goals for fluorspar remained at 1.4 million tons for acid grade and 1.7 million tons for metallurgical grade.

On July 8, the President approved National Security Council (NSC) recommendations for modernizing the strategic and critical materials stockpile. Under the NSC proposal, the stockpile would be structured into two tiers. Tier I would contain materials required by military, industrial, and essential civilian users during a military conflict, which would not be available from domestic or reliable foreign sources. Tier II would contain a supplemental reserve of material already possessed by the Government. The status of fluorspar was deferred until further detailed studies could be made. At yearend, this proposal was under consideration by the Congress. The Department of Defense Authorization Act, 1986 (Public Law 99-145), signed by the President on November 8, 1985, stated that no action may be taken before October 1, 1986, to implement or administer any reduction in a stockpile goal in effect on October 1, 1984.

As in previous years, a 22% depletion allowance was granted against Federal income tax applied to the mining of domestic fluorspar compared with a 14% allowance for foreign production.

DOMESTIC PRODUCTION

Illinois remained the leading producing State, accounting for over 90% of all U.S. shipments. Data on shipments of fluorspar by State and grade were withheld to avoid disclosing company proprietary data.

Ozark-Mahoning Co., the Nation's largest fluorspar producer, operated three mines and a flotation plant in Pope and Hardin Counties, IL. Hastie Trucking and Mining Co. operated near Cave-In-Rock, IL. Hastie mined very little ore but shipped metallurgical-grade fluorspar from its stockpile to consumers. Inverness Mining Co., a former producer, dried imported fluorspar at its facilities at Cave-In-Rock, IL, and East Liverpool, OH, for sale primarily to consumers in the ceramic industry.

In the West, J. Irving Crowell, Jr. and Son produced and shipped metallurgical-grade fluorspar from its Crowell-Daisy Mine in Nye County, NV. D&F Minerals Co. produced and shipped a small quantity of metallurgical-grade fluorspar from its Paisano Mines, south of Alpine, TX. The Spor Bros. Fluorine Mine in Millard County, UT, reported mining activity.

Reported shipments of fluorspar briquets for use in steel furnaces increased 47% to approximately 148,000 tons from a revised production of 101,000 tons in 1984. Fluorspar briquets were produced by two plants owned by Cametco Inc., one plant owned by Mercier Corp., one plant owned by National Briquetting Co., and one plant owned by Oglebay Norton Co. Oglebay Norton also dried, packaged, and shipped imported ceramic- and acid-grade fluorspar.

Fourteen plants processing phosphate rock for the production of phosphoric acid and two plants producing HF sold or used 75,000 tons of byproduct fluosilicic acid, which was equivalent to 132,000 tons of fluorspar, valued at $4.2 million. Fluosilicic acid sold or used in 1984 was revised to 67,000 tons. According to the U.S. Department of Commerce, domestic production of sodium silicofluoride (100% Na_2SiF_6) was 21,622 tons in 1984. Total shipments were 19,594 tons in 1984 valued at $5,336,000. Sodium silicofluoride was made primarily from fluosilicic acid, which was converted to sodium salt by reaction with sodium carbonate, sodium hydroxide, or sodium chloride.

In 1985, Moodie Minerals Exploration Co. invested capital into the Babb-Barnes Mine and mill at Salem, KY, and planned to resume production. The mine had been owned, but not operated, by the Marathon Oil Co. The mine was last operated by Frontier Resources Inc., which had closed the mine in 1978 for economic reasons.

CONSUMPTION AND USES

Acid-grade fluorspar, containing greater than 97% calcium fluoride (CaF_2), was used as feedstock in the manufacture of HF, the key ingredient in the manufacture of fluorine chemicals for the aluminum, fluorochemical, and uranium industries. Ceramic-grade fluorspar, containing 85% to 95% CaF_2, was used in the ceramic industry for the production of glass and enamel, to make welding rods, and as a flux in making steel. Metallurgical-grade fluorspar, containing 60% to 85% or more CaF_2, was used primarily by the iron and steel industry as a flux.

Reported domestic consumption of fluorspar decreased 25% because of large decreases in the use of fluorspar for HF and iron and steel production. The HF and steel industries accounted for 72% and 25%, respectively, of reported consumption. According to the American Iron and Steel Institute (AISI), raw steel production decreased from 92.53 million tons in 1984 to 87.35 million tons in 1985. A comparison of the AISI data with fluorspar consumption data collected in the Bureau of Mines canvass of U.S. steel producers shows, on the average, a decreasing rate of fluorspar consumption per ton of raw steel produced during 1983-85; however, steel production in open-hearth furnaces showed an increasing rate of fluorspar consumption. On the basis of furnace type, the average fluorspar consumption per ton of raw steel was as follows:

Type of furnace	Fluorspar consumption (pounds per short ton)		
	1983	1984	1985
Open hearth	6.44	8.61	10.78
Basic oxygen	4.19	3.99	2.68
Electric	3.80	2.94	2.08
Industry average	4.30	4.06	3.08

In the ceramic industry, fluorspar was used as a flux and as an opacifier in the production of flint glass, white or opal glass, and enamels. Fluorspar was used in the manufacture of glass fibers, aluminum, cement, and brick, and was also used in the melt shop by the foundry industry.

Seven companies produced HF in seven plants. The U.S. Department of Commerce, Bureau of the Census, reported that anhydrous, technical, and aqueous HF "produced and withdrawn from the system" was approximately 162,400 tons, compared with 168,100 tons reported at yearend 1984 but later revised to 190,134 tons. HF produced and consumed in the same plant in 1984 was reported as 48,348 tons.

The Harshaw Filtrol Partnership closed its anhydrous HF unit at its Harvard-Denison chemical manufacturing facility in Cleveland, OH. The HF operation was in need of a large capital investment to maintain a competitive and safe operating level, and the company felt that market conditions for the expenditure were unjustified.

The consumption pattern of HF was reported as follows: fluorocarbons, 41%; aluminum production, 31%; petroleum alkylation, 4%; stainless steel production, 4%; uranium processing, 4%; rare metals, 4%; other, including glass etching, fluoride salts, and herbicides, 12%.[3] Chlorofluorocarbons were produced by five companies. According to U.S. International Trade Commission data, production of trichlorofluoromethane (F-11) decreased 12% to 81,300 tons; dichlorodifluoromethane (F-12) output decreased 17% to 141,000 tons; and chlorodifluoromethane (F-22) production decreased 14% to 109,350 tons.

Another major use of HF was in the synthesis of fluorine chemicals used in aluminum reduction cells. An estimated 40 to 60 pounds of fluorine was consumed for each ton of aluminum produced. Aluminum fluoride was used by aluminum producers to lower the melting point and increase the conductivity of electrolytes in the smelting process. It was also used as a flux ingredient for the removal of magnesium in the refining of aluminum scrap. Aluminum fluoride was used by the ceramic industry for some body and glaze mixtures and in the production of specialty refractory products. It was used in the manufacture of aluminum silicates and in the glass industry as a filler.

HF was consumed in concentrating uranium isotope 235 for use as nuclear fuel. It was also used in stainless steel pickling, petroleum alkylation, glass etching, oil and gas well treatment, and in the manufacture of a host of fluorine chemicals used in dielectrics, metallurgy, wood preservatives, pesticides, mouthwashes and decay-preventing dentifrices, plastics, and water fluoridation.

Fluosilicic acid was used primarily in water fluoridation, either directly or after being processed to sodium silicofluoride, and by the aluminum industry.

Allied Corp. started up a commercial-scale plant at Metropolis, IL, to produce fluorinated carbon products. Allied reported that its fluorinated carbons, which are made by reacting carbon with elemental

fluorine, are nonfusable powders with good chemical resistance, high thermal stability, a low coefficient of friction, and variable electrical resistivity. Fluorinated carbons were used as a cathode material in lithium cells and as a solid lubricant.[3]

Table 2.—U.S. consumption (reported) of fluorspar, by end use

(Short tons)

End use or product	Containing more than 97% calcium fluoride (CaF_2)		Containing not more than 97% calcium fluoride (CaF_2)		Total	
	1984	1985	1984	1985	1984	1985
Hydrofluoric acid (HF)	530,527	408,880	--	--	530,527	408,880
Glass and fiberglass	4,952	1,337	846	1,083	5,798	2,420
Enamel and pottery	--	--	1,619	1,211	1,619	1,211
Welding rod coatings	8,414	9,867	2,600	1,460	11,014	11,327
Primary aluminum and magnesium	--	--	--	W	--	W
Iron and steel castings	924	--	15,591	8,689	16,515	8,689
Open-hearth furnaces	--	--	35,893	34,647	35,893	34,647
Basic oxygen furnaces	--	--	105,253	69,615	105,253	69,615
Electric furnaces	2,021	2,065	42,597	28,087	44,618	30,152
Other	--	--	1,344	682	1,344	682
Total	546,838	422,149	205,743	145,474	752,581	567,623
Stocks, Dec. 31	70,446	37,732	49,821	8,858	120,267	46,590

W Withheld to avoid disclosing company proprietary data; included with "Other."

Table 3.—U.S. consumption (reported) of subacid grades of fluorspar in 1985, by end use

(Short tons)

End use or product	Containing not more than 97% calcium fluoride (CaF_2)		
	Flotation concentrates	Lump or gravel	Briquets or pellets
Chemicals and allied products: Welding fluxes	1,460	--	--
Glass, ceramic, bricks:			
Glass	1,083	--	--
Other glass, clay products	1,211	--	--
Primary metals:			
Iron and steel foundries	122	8,541	26
Steel mills:			
Basic oxygen furnaces	1,685	25,012	42,918
Electric furnaces	1,814	25,075	1,198
Open-hearth furnaces	3,054	28,663	2,930
Other identified end uses	49	633	--
Total	10,478	87,924	47,072

Table 4.—U.S. consumption of fluorspar (domestic and foreign), by State

(Short tons)

State	1984	1985
Alabama, Kentucky, Tennessee	68,643	56,490
Arizona, Colorado, Utah	12,141	9,028
Arkansas, Kansas, Louisiana, Missouri	161,450	125,306
California	W	W
Connecticut, Massachusetts, New York, Rhode Island	6,540	4,108
Illinois	10,747	5,827
Indiana	37,919	37,306
Michigan	2,294	W
New Jersey	W	W
Ohio	72,723	36,538
Oregon and Washington	W	W
Pennsylvania	54,950	30,130
Texas	278,728	237,484
West Virginia	14,480	1,633
Other[1]	31,966	23,773
Total	752,581	567,623

W Withheld to avoid disclosing company proprietary data; included with "Other."
[1]Includes Iowa, Maryland, Virginia, Wisconsin, and data indicated by symbol W.

STOCKS

Fluorspar consumer stocks decreased 61% to about 47,000 tons.

PRICES

Domestic producer prices of all grades of fluorspar and fluorspar briquets reported in the Engineering and Mining Journal (E&MJ) remained at 1984 levels. E&MJ yearend price quotations serve as a general guide but do not necessarily reflect actual transactions.

Yearend price quotations in the Chemical Marketing Reporter (CMR) were $0.6875 per pound for anhydrous HF and $43.00 per 100 pounds for aqueous HF, 70%, in tanks. The CMR yearend price for cryolite was $550 per ton. CMR yearend price quotations for fluosilicic acid were $151.00 per ton for 15-gallon drums, 30% basis, and $110.00 per ton for tanks, 23% basis. All of these prices were unchanged from those of 1984.

Table 5.—Prices of domestic and imported fluorspar

(Dollars per short ton)

	1984	1985
Domestic, f.o.b. Illinois-Kentucky:		
Metallurgical: 70% effective CaF_2 briquets	125	125
Ceramic, variable calcite and silica:		
88% to 90% CaF_2	100	100
95% to 96% CaF_2	170	170
97% CaF_2	165-175	165-175
Acid, dry basis, 97% CaF_2:		
Carloads	173	173
88% effective CaF_2 briquets	179	179
European and South African:[1] Acid, term contracts	140-180	140-180
Mexican:[2]		
Metallurgical:		
70% effective CaF_2, f.o.b. vessel, Tampico	80.06	80.06
70% effective CaF_2, f.o.b. cars, Mexican border	75.63	75.63
Acid, bulk: 97 + %, Mexican border	108.33	108.33

[1]C.i.f. east coast, Great Lakes, and gulf ports.
[2]U.S. import duty, insurance, and freight not included.

Source: Engineering and Mining Journal, Dec. 1984 and 1985.

FOREIGN TRADE

According to Bureau of the Census data, U.S. fluorspar exports of all grades decreased 21% and had an average value of $110 per ton. Synthetic cryolite exports decreased 24% to 13,000 tons, representing 15,600 tons of equivalent fluorspar, valued at $5.4 million.

Imports for consumption of fluorspar decreased significantly. Acid-grade imports decreased by 17%, and imports of subacid-grade material decreased by 34%. Imports from Mexico, the largest foreign supplier, were 51% of the combined fluorspar total. The Republic of South Africa supplied 33%; Spain, 6%; China, 4%; Italy, 3%; and Morocco, 3%. Small quantities were also imported from Canada, France, the Federal Republic of Germany, and the United Kingdom. The average unit value of imported acid- and subacid-grade fluorspar was $97.12 and $63.53, respectively.

U.S. import duties remained in effect for all grades of fluorspar. The duty was $1.875 per ton for acid grade and 13.5% ad valorem for ceramic and metallurgical grades.

Imports for consumption of HF decreased slightly to a quantity equivalent to about 157,000 tons of fluorspar. Imports for consumption of natural and synthetic cryolite decreased 27% and had an average value of $603 per ton. Cryolite imports represented 20,000 tons of equivalent fluorspar.

The United States also imported many fluorochemicals, including ammonium bifluoride, chlorodifluoromethane, dichlorodifluoromethane, fluorocarbon polymers, hexafluoropropylene, polytetrafluoroethylene, and trichlorodifluoromethane.

Table 6.—U.S. exports of fluorspar, by country

Country	1984		1985	
	Quantity (short tons)	Value	Quantity (short tons)	Value
Australia	--	--	33	$3,287
Canada	11,863	$1,188,601	8,503	851,036
Dominican Republic	317	82,759	1,018	185,447
Mexico	--	--	25	3,287
Venezuela	86	21,066	90	19,563
Total	12,266	1,292,426	[1]9,671	1,062,620

[1]Data do not add to total shown because of independent rounding.

Source: Bureau of the Census.

Table 7.—U.S. imports for consumption of fluorspar, by country and customs district

Country and customs district	1984		1985	
	Quantity (short tons)	Value[1] (thousands)	Quantity (short tons)	Value[1] (thousands)
CONTAINING MORE THAN 97% CALCIUM FLUORIDE (CaF_2)				
Canada:				
Buffalo	--	--	24	$1
Detroit	259	$25	--	--
Laredo	81	6	437	41
Total	340	31	461	42
China:				
Baltimore	39	11	--	--
New Orleans	--	--	5,882	551
Total	39	11	5,882	551
France: Houston	113	37	517	199
Italy:				
Houston	61,619	7,325	15,765	1,557
New Orleans	--	--	2,480	259
Total	61,619	7,325	18,245	1,816
Mexico:				
El Paso	90,738	8,219	72,255	6,657
Houston	--	--	6,112	675
Laredo	120,437	11,125	95,580	8,967
New Orleans	15,612	1,646	3,451	194
Nogales	--	--	290	6
Total	226,787	20,990	177,688	16,499
Morocco: New Orleans	--	--	15,674	1,564
South Africa, Republic of:				
Houston	44,675	3,656	36,772	3,259
New Orleans	140,096	14,833	132,245	13,598
Philadelphia	9,958	959	12,085	1,294
Total	194,729	19,448	181,102	18,151
Spain:				
Cleveland	20,648	2,211	12,968	1,337
New Orleans	17,173	1,803	19,449	1,794
Total	37,821	4,014	32,417	3,131
United Kingdom: Milwaukee	--	--	24	2
Grand total	521,448	51,856	432,010	41,955

See footnote at end of table.

Table 7.—U.S. imports for consumption of fluorspar, by country and customs district —Continued

Country and customs district	1984 Quantity (short tons)	1984 Value[1] (thousands)	1985 Quantity (short tons)	1985 Value[1] (thousands)
CONTAINING NOT MORE THAN 97% CALCIUM FLUORIDE (CaF_2)				
Canada:				
Buffalo	425	$39	284	$19
Detroit	177	12	153	6
Pembina	--	--	97	11
Total	602	51	534	36
China:				
Baltimore	30,473	2,460	16,831	1,334
New Orleans	20,602	1,409	--	--
San Francisco	11,453	966	--	--
Total	62,528	4,835	16,831	1,334
Germany, Federal Republic of:				
Chicago	--	--	37	15
Houston	11	3	--	--
Total	11	3	37	15
Italy: Los Angeles	23	9	--	--
Mexico:				
Buffalo	401	42	1,318	82
Detroit	2,544	202	2,555	137
El Paso	16,699	796	9,453	441
Laredo	39,097	3,067	23,204	1,325
New Orleans	50,120	3,425	57,148	3,754
Philadelphia	7,445	725	9,869	560
Total	116,306	8,257	103,547	6,299
South Africa, Republic of: New Orleans	2,793	230	--	--
Grand total	182,263	13,385	120,949	7,684

[1]Customs, insurance, and freight (c.i.f.) value at U.S. port.

Source: Bureau of the Census.

Table 8.—U.S. imports for consumption of hydrofluoric acid (HF), by country

Country	1984 Quantity (short tons)	1984 Value[1] (thousands)	1985 Quantity (short tons)	1985 Value[1] (thousands)
Canada	43,441	$36,644	36,637	$33,869
France	17	14	--	--
Germany, Federal Republic of	56	82	119	112
Japan	4,422	3,429	4,137	2,859
Korea, Republic of	--	--	17	13
Mexico	66,399	60,694	62,504	56,233
Mozambique	--	--	601	533
Netherlands	--	--	20	18
Spain	35	29	35	28
Taiwan	--	--	17	16
United Kingdom	61	48	324	336
Total	114,421	100,940	104,411	94,017

[1]Customs, insurance, and freight (c.i.f.) value at U.S. port.

Source: Bureau of the Census.

Table 9.—U.S. imports for consumption of cryolite, by country

Country	1984		1985	
	Quantity (short tons)	Value[1] (thousands)	Quantity (short tons)	Value[1] (thousands)
Brazil	17	$12		
Canada	13,883	7,079	2,414	$1,287
China	19	10		
Denmark	2,724	2,018	3,737	2,492
France	256	295		
Germany, Federal Republic of	444	377	666	380
Greenland	65	61		
Italy			3,327	1,960
Japan	3,663	2,554	5,169	3,244
Netherlands	98	72	907	532
United Arab Emirates	830	446		
United Kingdom	723	200	376	108
Total	22,722	13,124	16,596	10,003

[1]Customs, insurance, and freight (c.i.f.) value at U.S. port.

Source: Bureau of the Census.

WORLD REVIEW

Canada.—Assessment and development work continued at Eaglet Mines Ltd.'s Quesnet Lake property in British Columbia. The large, low-grade deposit reportedly contained recoverable fluorspar, silver, lead, zinc, and molybdenum. Minworth Ltd., a British firm, continued development work to reopen a fluorspar mine near St. Lawrence, Newfoundland. The mine had been last operated in 1977 by the St. Lawrence Corp. and Newfoundland Fluorspar Ltd., formerly a subsidiary of Aluminum Co. of Canada Ltd.

France.—The Belgian firm Solvay & Cie. planned to spend approximately $10 million to increase production capacity of its fluorinated monomer and polymer complex in Tavaux, France. Plans were to increase vinylidene fluoride, used in the manufacture of fluorinated thermoplastic polymers and elastomers, from 1,650 tons per year to 5,500 tons and polyvinylidene fluoride (PVDF), a fire-retardant resin, from 1,650 tons to 2,500 tons by October 1986. Solvay has been the world's second largest producer of PVDF after Pennwalt Corp.[4]

United Kingdom.—Shell Chemicals UK Ltd. began expanding the capacity of its fluorochemicals production unit at Stanlow, Cheshire, by more than 50%. The unit, the largest of its kind in the world, has produced a variety of fluorinated compounds derived by halogen exchange chemistry. The expansion was to be completed during 1986.

Table 10.—Sales of Mexican fluorspar, by grade

(Short tons)

Grade	1981	1982	r1983	r1984	1985
Acid	532,765	338,732	400,579	508,235	409,800
Ceramic	100,511	27,202	49,285	54,562	51,982
Metallurgical	250,121	120,478	117,190	230,375	309,490
Submetallurgical	211,505	116,030	93,563	117,113	57,779
Total	1,094,902	602,442	660,617	910,285	829,051

rRevised.

Source: Instituto Mexicano de la Fluorita A.C.

Table 11.—Fluorspar: World production, by country[1]

(Short tons)

Country[2] and grade[3]	1981	1982	1983	1984[p]	1985[e]
Argentina	22,878	26,155	31,950	25,526	27,500
Brazil (marketable):					
Acid grade	39,932	35,274	47,399	[e]49,600	51,800
Metallurgical grade	19,184	20,944	28,660	[e]33,000	37,500
Total	59,116	56,218	76,059	[e]82,600	89,300
China:[e]					
Acid grade	88,000	88,000	110,000	110,000	110,000
Metallurgical grade	440,000	440,000	440,000	606,000	606,000
Total	528,000	528,000	550,000	716,000	716,000
Czechoslovakia[e]	106,000	106,000	106,000	106,000	105,000
Egypt	590	99	13	[e]55	55
France:					
Acid and ceramic grade	185,960	177,725	155,957	175,378	165,000
Metallurgical grade	96,452	90,825	60,488	80,469	77,200
Total	282,412	268,550	216,445	255,847	242,200
German Democratic Republic[e]	110,000	110,000	110,000	110,000	110,000
Germany, Federal Republic of (marketable)	79,155	86,685	88,964	87,744	88,000
Greece[e]	[4]322	330	330	330	330
India:					
Acid grade	14,711	13,676	[e]12,000	[e]13,000	13,000
Metallurgical grade	5,924	6,294	[e]5,000	[e]6,000	6,000
Total	20,635	19,970	[e]17,000	[e]19,000	19,000
Italy:					
Acid grade	142,019	147,850	113,439	121,618	116,000
Metallurgical grade	39,018	36,180	82,409	85,904	83,000
Total	181,037	184,030	195,848	207,522	199,000
Kenya: Acid grade	105,849	97,804	65,129	51,343	55,000
Korea, North: Metallurgical grade[e]	44,000	44,000	44,000	44,000	44,000
Korea, Republic of: Metallurgical grade	7,125	4,042	7,012	5,150	5,500
Mexico:					
Acid grade	559,973	450,845	448,640	379,725	[4]417,469
Ceramic grade	119,049	59,525	50,706	40,307	[4]30,011
Metallurgical grade	338,409	182,983	80,469	235,079	[4]297,897
Submetallurgical grade[5]	212,746	116,845	87,082	115,878	[4]57,779
Total	1,230,177	810,198	666,897	770,989	[4]803,156
Mongolia: Metallurgical grade[e]	656,000	739,000	772,000	[r]816,000	816,000
Morocco: Acid grade	73,524	55,336	66,469	72,642	77,000
Pakistan	[r]6	[r]897	370	3,003	2,600
Romania: Metallurgical grade[e]	22,000	22,000	22,000	22,000	22,000
South Africa, Republic of:					
Acid grade	497,819	323,882	256,563	318,892	[4]341,949
Ceramic grade	6,744	10,613	7,061	4,963	[4]6,310
Metallurgical grade	42,758	30,188	31,356	28,010	[4]36,676
Total	547,321	364,683	294,980	351,865	[4]384,935
Spain:					
Acid grade	235,471	173,289	210,265	279,128	248,000
Metallurgical grade	47,963	40,868	45,840	46,788	49,600
Total	283,434	214,157	256,105	325,916	297,600
Thailand:					
Acid grade	60,827	89,314	51,466	62,998	44,000
Metallurgical grade	173,405	194,099	176,324	253,783	220,000
Total	234,232	283,413	227,790	316,781	264,000
Tunisia: Acid grade	38,409	36,607	37,493	49,064	49,600
Turkey: Metallurgical grade[e]	[4]2,189	2,200	2,200	2,200	2,200
U.S.S.R.[e]	585,000	595,000	595,000	606,000	617,000
United Kingdom	[r]281,640	[r]221,344	144,733	150,686	165,000
United States (shipments)	115,404	77,017	[e]61,000	[e]72,000	66,000
Uruguay[e]	[6]	[6]	[6]	[6]	

See footnotes at end of table.

Table 11.—Fluorspar: World production, by country[1] —Continued

(Short tons)

Country[2] and grade[3]	1981	1982	1983	1984[p]	1985[e]
Grand total	[r]5,616,455	[r]4,953,735	4,655,787	5,270,263	5,267,976

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through May 13, 1986.

[2]In addition to the countries listed, Bulgaria is believed to have produced fluorspar, but production is not officially reported, and available information is inadequate for the formulation of reliable estimates of output levels.

[3]An effort has been made to subdivide production of all countries by grade (acid, ceramic, and/or metallurgical). Where this information is not available in official reports of the subject country, the data have been entered without qualifying notes.

[4]Reported figure.

[5]Same grade range as metallurgical but primarily contains greater quantities of silica impurities.

[6]Revised to zero.

TECHNOLOGY

The Oak Ridge National Laboratory developed a new method of removing silica from silicon carbide powders using gaseous hydrogen fluoride.[5]

A 2-year study jointly funded by E. I. du Pont de Nemours & Co. Inc. and Allied determined that trichlorotrifluoroethane, a chemical solvent sold as fluorocarbon-113 and used to clean metals and sensitive equipment such as electronic components, did not appear to be a carcinogen, mutagen, or teratogen in animal tests or human experience.[6]

The National Institutes of Health and Du Pont continued sponsoring research to develop a "blood substitute," or oxygen-transport fluid, using perfluorochemicals. Alpha Therapeutics Corp., a U.S. subsidiary of Green Cross Corp. of Osaka, Japan, applied for Food and Drug Administration (FDA) approval of its perfluorochemicals, emphasizing its use in treating heart problems and cancer. Admamantech, a subsidiary of Sun Co. Inc., was also conducting studies on perfluorochemicals.

The FDA approved the sale of flecainide acetate, the first of a new electrophysiologic class of drugs for the treatment of irregular heart rhythms. It was the first fluorine containing drug approved for cardiac arrhythmias.[7]

[1]Physical scientist, Division of Industrial Minerals.

[2]Chemical Marketing Reporter. V. 228, No. 10, 1985, p. 50.

[3]Chemical Week. V. 137, No. 23, 1985, p. 5.

[4]———. V. 137, No. 3, 1985, p. 43.

[5]Work cited in footnote 4.

[6]Chemical & Engineering News. V. 63, No. 30, 1985, p. 17.

[7]———. V. 63, No. 46, 1985, p. 61.

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